

**MAKING A CASE
FOR EFFECTIVE SCHEDULING OF ARSON INVESTIGATORS**

STRATEGIC MANAGEMENT OF CHANGE

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ABSTRACT

The Anne Arundel County Fire Investigation Unit was not meeting national averages of arson cases cleared by arrest. Attempts to implement case management strategies seemed to be hindered by the investigators shift schedule. The schedule, put into use a few years ago in an effort to reduce overtime, had investigators off-duty for four days in a row. This schedule, as many others found in use for arson investigation, are typically used for suppression and EMS delivery. The problem identified for the research was to determine if the shift schedules were effective for arson investigations. The research attempted to gather information on effectual scheduling of arson units and police detectives units. While the research did not find a specific schedule that was promoted as a model for criminal investigation, it did reveal shortcomings in the schedule being used. Information was identified to support scheduling of investigators during certain times of the day to effectively carry out the investigative function.

The results of the applied research project showed that the shift being used by Anne Arundel County was not practical for the criminal phase of an arson investigation. The research revealed that the follow-up investigation is more critical than a timely response. It was also shown that the shift was not conducive for the use of case management strategies shown effective in improving arson casework. Since no one shift was shown as a model schedule, the design of a shift needed to account for several factors. In addition to the investigation, several external factors, such as available staffing, FLSA, overtime limitations, investigator safety, and training needs also needed to be considered. Unfortunately, the research also revealed that little information is available on how to go about designing shift schedules. However, based on the information gathered, three possible schedules were proposed.

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INTRODUCTION

Throughout the United States, the crime of arson is a problem. It is reported to be one of the fastest growing and most under-reported crimes in the nation (Fire Investigation, 1997).

In Anne Arundel County, the department of EMS/Fire/Rescue is responsible for the investigation of fires. This responsibility includes the determination of origin and cause, as well as, the criminal follow up of those fires determined to be arson. The pursuit of those criminally responsible for incendiary fires requires that investigators assigned to the investigation unit have police powers. In addition, it requires that the investigation unit function much like a police detective unit, rather than a typical fire agency unit.

The crime of arson is often regarded as being among the most difficult crimes to prove. This is due to the unique fact that arson is the only type of crime where it must first be proven that a crime took place (Beering, 1990). In other words, the fire investigator must first prove that all possible accidental causes of a fire have been eliminated. Once accidental causes have been ruled out, the investigator must still make a case, beyond a reasonable doubt, that the fire was intentionally set in order to get a conviction. Because arson is a difficult crime to prove, arson investigation units must function like the best police units to be effective.

To make a determination if an investigation unit is effective, we must first define how to measure effectiveness. The essential step in effectiveness evaluation is deciding what to measure. The National Fire Academy teaches that statistics should be kept on the number and types of fires, the number of injuries and fatalities, the number of fire investigations, the number of cases solved, and the prosecution rate (Management for Arson, 1996). Another important factor is understanding the overall goal of the investigation unit. In 1979, McGuinness described the main purpose of arson investigation.

The basic function of an Arson Investigation Unit is the prevention of incendiary fires. All the duties that Unit personnel perform, such as determining fire cause and origin, making arrests, and aiding in criminal prosecution, follow from that basic function.

How does a Unit prevent arson? It does this by employing the tool of effective investigation, and by prosecution of those who set fires, in order to serve as a strong deterrent to others who might commit arson in the future.

(p. 2)

The key to the above statement is effective investigation. Since the fire investigator must both eliminate accidental causes and prove that the fire was deliberately set, an effective investigation is crucial.

How then do we determine whether effective investigations are being conducted? It would seem the answer lies in conviction rates. "According to experts in crime prevention, the arrest and incarceration of the arsonist is the crime's one major deterrent" (Management for Arson, 1996, p. 3-2). It is important to note that this statement requires not only the arrest, but also the incarceration of the arsonist to provide the deterrent. It is sobering then to note that only fifteen percent (15%) of arson cases result in an arrest. It is even more sobering that only three percent (3%) result in convictions, meaning that an arsonist has a ninety-seven percent (97%) chance of getting away with the crime (Fire Investigation Unit Management Guide, 1997). If convictions leading to incarcerations are the main deterrent, it would appear that little in the way of deterrent is being accomplished. In addition, the conviction rate does not take into account those people who are convicted, but are not incarcerated, thus lessening the impact of deterrence.

During my tenure as the Chief Fire Marshal for Anne Arundel County, I began to question the investigation unit's effectiveness in solving arson cases, particularly those leading to convictions. Having attended the National Fire Academy's course *Management for Arson Prevention and Control*, I became aware of the need to better manage cases to improve the chances of solvability. Upon returning to work, I attempted to institute some of the case management principles taught in the course. Implementation seemed to be hindered by the shift schedule the investigators work. The schedule, two ten-hour days, followed by two fourteen-hour nights, followed by four days off, does not lend itself to effective use of case management tools. This shift does not facilitate immediate and aggressive follow up. An investigator must take the initiative to request overtime to work the case during scheduled time off. Even if an investigator had a workable case, the request to do immediate follow-up was sometimes inhibited by plans the investigator had already made for the four-day break. The problems I encountered caused me to question the effectiveness of the department's investigation unit. It also caused me to question if a change in the shift would facilitate improvement. This leads to the questions this research paper attempts to address.

- 1) Should Anne Arundel County EMS/ Fire/Rescue be concerned about improving arson investigation effectiveness?
- 2) Can the shift schedule investigators work have an impact on the ability to conduct effective arson investigations?
- 3) What factors external to an investigation need to be considered in deciding on a shift schedule for arson investigators?
- 4) Do model fire investigation shifts exist that would be suitable for Anne Arundel County?

BACKGROUND AND SIGNIFICANCE

Prior to my arrival as the Chief Fire Marshal in 1992, the Investigation Section of the Division had been struggling with issues regarding shift schedules. At the time, eight investigators were assigned to two shifts of four personnel each. Investigators worked a five-day forty-hour week. Each shift was comprised of two lieutenants and two fire fighters. The schedule consisted of one shift working day work, from 0800 to 1600 hours for one week. The other shift worked nights from 1600 to 2400 hours. The following week the shifts were reversed, so that the investigators alternated working a week of day work followed by a week of night work. After midnight, an investigator was on-call to handle investigations as needed. The investigators received overtime when called back to duty. Weekends were also covered by callout using a rotation system among investigators.

In November of 1991, a proposal was made to change the investigators shift. The Investigation Unit Captain was given direction on problems the new shift had to address. These included, reduction of overtime by reducing callout, no additional personnel, no overtime to cover vacation time, and development of a callout list for times when there was no investigator scheduled to work. Three proposals were made. Each proposal provided four shifts of two investigators each. All three proposals also included the investigators working two ten-hour days followed by two fourteen-hour nights, followed by four days off. These proposals all covered twenty-four hours a day, seven days a week. The selected proposal was put into use on a trial basis for six months starting in March of 1992. I took command of the Fire Marshal Division in August of 1992, just as the six-month trial was expiring. After the initial six-month trial, it was decided to extend the trial an additional six months to encompass the winter months. A major factor being considered was overtime expenditures. After the

twelve-month trial period it was determined that overtime expenditures were roughly the same for both shifts. The majority of investigators preferred the 10/14 shift and it was decided it would remain in effect.

After taking command of the Fire Marshal Division, I attended the Anne Arundel County Police Academy and several investigation related courses. Among these courses was the National Fire Academy course *Management for Arson Prevention and Control*. The course covered many aspects of managing an Arson Task Force and included a segment on Case Management. In addition, I worked with members of arson units around the State of Maryland on a program to develop an Arson Investigation Unit Management Guide. The development of the guide was funded through an arson prevention grant to the Maryland State Fire Marshal's Office from the United States Fire Administration (USFA). This guide includes a segment on case management and a section on shift schedules.

After returning from the course and working on the guide, I met with the Investigation Unit Captain to discuss implementing some of the case management procedures. The attempt to implement these procedures seemed to be hampered by the shift schedule. A particular problem appeared to be the four-day break investigators had after their two night shifts. This shift also provided little time for the Captain to meet with investigators to discuss cases and other work-related issues during his normal work schedule (4-10 hour days). By using only a couple of days of annual leave, an investigator can miss working a shift with the Captain for more than two weeks. The lack of contact with the unit Captain was both a case management problem and a general supervision problem. The reluctance to make another shift change was strong, since the shift had recently been altered. It was obvious that any additional changes would need to be supported by substantive reasons and justification for a new shift.

Any proposed shift change will impact the investigation staff in both their professional and personal lives. The implementation of such change needs to be done in an organized fashion, following the Change Management Model taught in *Strategic Management of Change*. This research attempts to complete the first phase of the model, which is analysis. The suggestion of a possible shift change created consternation and controversy within the investigation unit. In addition, a segment of the course discussed "Peak-Load Staffing," otherwise known as systems status management. The concept of scheduling personnel based on the history of when calls are received appeared to have potential in addressing how to schedule arson investigators. Systems status management is further explored in this research.

LITERATURE REVIEW

The literature review for this topic provided little information that directly discusses shift scheduling for arson investigators. This was not surprising since most fire service literature focuses on suppression and EMS delivery systems. However, I did expect to find relevant material from police sources on scheduling investigative positions. Support is found for the correlation between police investigative units and fire department arson units. In *Organization, Staffing, and Administration, of an Arson Investigation Unit*, the author writes that arson investigation units are in essence small specialized police units (p.7).

Some of the fire service literature on shift scheduling does provide generic information that can be applied to the research. One source reveals that public support for paying emergency personnel for unstructured or "stand-by" time is waning (Gilespie, 1997). It seems less likely that the public would support unstructured time for investigative personnel, whose work essentially takes place after the emergency. Police literature shows that police agencies

apparently have been more adept at adjusting staffing based on workload analysis. A review of *Patrol Deployment* by Levine and McEwen (1985), indicates that police departments are more frequently moving toward shift allocations based on when the workload is at its peak.

Traditionally the fire service has provided uniform staffing levels, because we never know when an emergency will take place. However, one source does note that ancillary units such as prevention and investigation are frequently staffed more heavily at certain times and on certain days (Gill, Kolde, Stenzel, and Heller, 1979).

A few sources discuss the pros and cons of the more commonly used shifts, but none provide specific scheduling suggestions or design criteria. The National Fire Academy course manual for *Management of Arson Prevention and Control* (1996) provides the evidence that a statistical analysis of an investigation unit is needed to measure unit effectiveness. Whether or not a unit is effective can be influenced by the investigation unit schedule. This source reveals that there are two competing needs in fire and arson investigation: the need for investigators to respond promptly to an incident, and the need to do the follow-up necessary on a criminal case. In viewing the situation from the Prosecutor's standpoint, Beering (1990) notes that arson investigation cases are challenging enough without adding a lack of communication between agencies to the problem. One possible consideration is staffing units at the highest levels during the highest demand, with investigators on-call during other times, seemed to be the simple answer. However, Stout (1989) points out that the simplicity ends with the basic idea. Several factors can impact when staffing is needed most. The most important factors may be case follow-up, but as Burton (1995) states, the investigator's court time, training time, and other related duties should be considered. Another consideration must be the contract between the Union and the County. The Union Contract (1997) requires that an exigent need exist

before the County can even negotiate for a shift change. Finally, there is the human factor. Finding a schedule that works best all the time might be difficult, but finding a schedule that pleases everyone is impossible (Burton, 1995).

The research found one source that does make a distinction between the type of fire investigation work being conducted and the scheduling needs. Whether or not a unit is responsible for the criminal aspects of fire investigation impacts scheduling considerations. Finding schedules that suit the public, the investigators, and the need to be available for fires are only part of the equation. In fact, the duties of the investigators impact the scheduling choices. The 24-hour or 10/14 fire department shift schedules are effective for conducting the origin and cause determination phase of an incident. However, they are generally inefficient for conducting the criminal investigation phase of an incident (Fire Investigation Unit Management Guide, 1997). Information provided by Wilson (1993) supports the need for investigators to work a shift that best uses their investigative time. The distinction between fire investigation and the investigation of arson is critical. Fire investigation involves finding the origin and cause of the fire.

Since the literature provided little in the way of concrete discussion on shifts, or how they impact effective investigation I conducted interviews. One interview was with Captain Shipley (telephone interview, July 1, 1998) of the Anne Arundel County Police Department. He told me that little documentation is available in police circles on investigator schedules, because the police do not want criminals to find out how they work. However, specific information was available from Mr. Stanley Poole (telephone interview, September 29, 1998), who spoke on the necessity of working fire investigations immediately. Mr. Poole also suggested contacting the Virginia Beach Fire Department. He told me they had what he

believed was one of the most effective schedules for arson investigators. Information on the scheduling practices in Virginia Beach was provided by Captain Stanley Foster. Finally, I interviewed Dr. Dennis Seymour, Ph.D., (personal interview, August 20, 1998), a retired Maryland State Police Sergeant, criminal justice professor at the Community College of Baltimore County, and the owner/operator of a private investigation company. Dr. Seymour provides information regarding procedures used by criminal investigation units in police agencies.

PROCEDURES

The research procedures used in this paper started with a literature review at the Learning Resource Center (LRC) of the National Emergency Training Center (NETC) in Emmittsburg, Maryland in May 1998. During this time, I gathered a list of material potentially relevant to the research. I requested identified resources from the LRC through inter-library loan. Between June 1998, and August 1998, additional resources were reviewed at the Anne Arundel County Public Library, the Community College of Baltimore County Library, my personal library, Dr. Dennis Seymour's office library and the library at the Anne Arundel County Fire Marshal's Office. A review of materials available through the National Fire Protection Association (NFPA), the International Association of Chiefs' of Police (IACP), and the National Criminal Justice Reference Services (NCJRS) via the Internet was also made. The NCJRS web site provided a synopsis of available material. It should be noted that the Community College of Baltimore County library has several years worth of *Criminal Justice Periodical Index* catalogs available. These were reviewed for the years 1987 through 1997, in search of articles pertinent to the research.

During July 1998, I contacted the Anne Arundel County Police Department for information. I was referred to Captain David Shipley. Captain Shipley, when he was a sergeant, had been assigned to the joint Fire and Police Arson Investigation Task Force. This unit existed during the 1980's, but it was disbanded in the early 1990's. Captain Shipley referred me to the IACP. After the Internet searches, I contacted the IACP and spoke with a representative to obtain additional information and materials. I also contacted NCJRS and requested material, but was referred to the inter-library loan process to obtain the desired literature. The IACP material was mailed to me by the representative with whom I spoke. The NCJRS material was obtained through inter-library loan. Three pieces of literature requested from NCJRS were not available and were not received. The IACP has a fire service counterpart the International Association of Fire Chiefs (IAFC). As a member of this organization, I have access to the association's web site. Using the IAFC bulletin board, I posted a request for information regarding scheduling of fire and arson investigators. The notice was posted for at least three months with no responses.

During the process of gathering material for my research, I received a letter from the USFA regarding a program in which they sponsor fire investigation unit reviews. Each year ten fire investigation units are reviewed by the Tri-Data Corporation under a program sponsored by USFA. I contacted Tri-Data to find out if they had applicable information that I could review. I was referred to Mr. Stan Poole, who conducts the investigation unit reviews. Mr. Poole provided several essential pieces of information, but could not be specific about how other fire investigation units worked. The information he gathered is part of the studies done through the USFA grant. These studies are subject to confidentiality agreements with each jurisdiction. Mr. Poole was able to tell me that Virginia Beach Fire Investigation had an

effective schedule. I contacted Captain Stanley Foster of the Virginia Beach Fire Department, Fire Investigation Unit for specific information. In addition, I spoke to Dr. Dennis Seymour, program chair for the Criminal Justice curriculum at Community College of Baltimore County. Dr. Seymour supervised the Criminal Investigation Division during his tenure with the Maryland State Police.

My research was aimed at targeting four specific areas. First, I searched for credible sources of information on shift scheduling in the fire service. The intention of this search was to determine current practices that have influenced shift selection in fire investigation units. Second, I searched for information on shift scheduling practices in police departments. The intent of this part of the research was to compare police scheduling practices to fire service practices, with a view toward fire investigation units. The third aspect of the search focused on how scheduling impacts investigative effectiveness. Finally, I conducted a search to identify ancillary issues that need to be considered when discussing personnel scheduling.

Limitations

This research was subject to several limitations. Very few sources dealt directly with the issue of scheduling fire investigators. Most of the materials from fire service resources on shift scheduling discuss it from the perspective of suppression and medical service delivery.

Materials from police resources were also very limited. An initial search of the IACP resource list had one text that appeared to be right on point. *Managing Criminal Investigations Manual* was written in 1977, but is no longer in publication. In my conversation with the representative from IACP, Mr. Matthew Snyder, I was told that most of the resources available in the field of police work deal with allocation of patrol resources.

Some of the material is somewhat dated; however, interviews were conducted with subject matter experts to update information. Another limitation was the time factor allotted to complete the research. Several publications requested through NCJRS were on loan and were not available in time to be reviewed for this article.

RESULTS

1. Should Anne Arundel County EMS/Fire/Rescue be concerned about improving arson investigation effectiveness?

The fire service functions to protect its citizens. One of the best methods the fire service has to protect the public is the prevention of fires. Given that fire investigation units are responsible for determining what happened after the fire, their importance in prevention might be overlooked. However, the role of fire investigators in prevention is very important. The successful prosecution of arson cases, leading to the incarceration of the perpetrator, is one of the best deterrents to the arsonist or prospective arsonist (Management for Arson, 1996). When an arsonist is convicted and sentenced it sends a message to others that the chances of getting away with the crime are reduced. Successful fire investigation can also help prevent fires in other ways. As McGuiness (1979) notes, determining the cause of fires can help identify problem areas that need to be addressed through laws, prevention efforts or the establishment of programs to combat existing problems. So then, there are really two aspects to successful fire investigation in terms of the prevention effort. First, the successful identification of fire causes, whether or not they are incendiary, can help the fire service in deciding where to focus efforts toward prevention. Second, the successful prosecution of arsonists serves as a deterrent. Unfortunately, the low conviction rate in arson cases has done little to deter arsonists. Arson is

one of the fastest growing and most under-reported crimes in the United States (Fire Investigation, 1997).

To decide if the fire service should be concerned about arson investigation effectiveness, we need to establish the success rate in solving arson cases. In the United States, only about fifteen percent of arson cases result in an arrest (Fire Investigation, 1997). That equates to eighty-five percent of arsonists getting away with their crime. An even more telling statistic is the lack of success in arson prosecutions. "Although 15% of all arson offenses are solved by arrest, only 3% lead to a conviction. Arsonists have a 97% chance of 'getting away' with their crime" (Fire Investigation, 1997, p. 4-1). This is particularly troubling since it has already been established that incarceration is the real deterrent. In Anne Arundel County, the statistics are less promising. In 1997, Anne Arundel County experienced 129 fires that were classified as incendiary. A review of 1997 statistics reveals that only 10% of the incendiary fires were closed by arrest (see Appendix A). This is significantly lower than the national average of 15%. Interestingly, the conviction rate for arson crimes in Anne Arundel County during 1997 is 4% (see Appendix A). This is slightly better than the national average of 3% and equates to a 56% success rate in getting a conviction once an arrest has been made.

2. Can the shift schedule investigators work have an impact on the ability to conduct effective arson investigations?

Arson investigation is comprised of two separate phases. The first phase, is the origin and cause investigation and the second phase is the criminal investigation. These two responsibilities create a conflict in finding suitable investigation shifts. This dilemma is discussed in the *Ideas from Studies of State and Local Programs* (1994).

There are of course two competing needs for time in fire investigation work: the need for quick response to a suspicious fire scene and the need to conduct follow-up work and to coordinate with a myriad of offices, businesses, and governmental departments. The former demands availability mostly at night when a majority of arson fires occur; the latter requires daytime hours to develop the investigation. (p. 20)

This statement shows that the need to respond to fires to investigate occurs twenty-four hours a day, but the criminal follow-up is best accomplished during normal working hours. The dilemma is further shown by the contrast in two of the research sources. As Gillespie (1997) points out, "...the twenty-four hour shift is not twenty-four hours of productive time" (p. 2). However, others note that whenever a fire occurs, investigative services may be needed. (Gill, et al., 1979). It might seem reasonable to assume then that the rotating shift, as currently worked in Anne Arundel County, would be perfect for fire investigation.

Investigators cover twenty-four hours by working two days, then two nights, followed by a four-day break. The problem is that the follow-up needs to be conducted immediately. The twenty-four hour coverage does provide an immediate response by an investigator to the scene, but may delay the follow-up investigation. McGuinness (1979) writes, "the longer the delay, the less likely the case will be solved" (p 7). Effective criminal investigations suffer when fire investigators delay the follow-up. This argument is further supported by the *Fire Investigation Unit Management Guide* (1997). The guide cites the initial 24 to 72 hours following an incident as the window of maximum opportunity to develop key leads in a criminal investigation. The need for immediate follow-up is impeded by the 24-hour or 10/14 shift. The *Fire Investigation Unit Management Guide* (1997) reports that,

Studies conducted by the USFA have documented that 24-hour or 10/14 fire department shift schedules are effective for conducting the origin and cause determination phase of an incident, but are generally inefficient for conducting the follow-up criminal investigation phase of an incident. The delay often occurs when a fire investigator is "off-duty" for two, or in some cases, four days. (p. 1-14)

This does not take into consideration that on the 10/14 shift a fire investigator on the second shift of day work is then followed by two night works, followed by four days off. This totals six days that the investigator is not on day work to follow-up on the case. The need to investigate the scene as soon as possible is an argument used to support such shifts. However, while the shift provides a prompt response, it may delay follow-up. Dr. Seymour (personal interview, August 20, 1998) concurs, noting that most investigations benefit from a quick response, but fire investigation may be the exception. Fire investigators are often delayed in starting their investigation until the scene is rendered safe by suppression personnel. In addition, suppression personnel in Anne Arundel County are trained in arson detection and evidence preservation. Dr. Seymour (personal interview, August 20, 1998) points out that suppression personnel can be viewed much like the patrol officer in a police department. He notes that police agencies rely on patrol officers to provide the initial response, while on-call investigators respond to the scene. This arrangement allows criminal investigators to work predominantly during normal work hours. The need to work during normal business hours is directly related to the ability to effectively communicate with other agencies. Insurance companies, police records units, police detectives, and other businesses from which an investigator may need to gather information are often not readily available after normal

business hours. In his article *Secrets for a Successful Arson Prosecution*, Beering (1990) discusses the importance of communication between different agencies. He writes that "fire investigation is without question a very frustrating and challenging profession, often made more difficult because of a lack of communication among agencies involved in the various stages of the investigation" (p., 55).

The need for follow-up investigation is not always limited to communication with other businesses. Like any criminal investigation, it is often important to talk to potential witnesses, neighbors, and friends to name a few. Dr. Seymour (personal interview, August 20, 1998) says that the effort to identify, locate, and interview witnesses is best done at two times. One such time is during the evening, when people are home. The other time coincides with the time the crime took place. This may mean canvassing a neighborhood, making telephone calls, or copying license tag numbers from vehicles in the area around the time the fire occurred. In other words, business hours are not always the best time for investigative follow-up. Mr. Poole (telephone interview, September 29, 1998) agrees noting that a good time for follow-up investigation is between 5 p.m. and 9 p.m., when people are generally home. As Dr. Seymour (telephone interview, September 29, 1998) points out, the best time for follow-up investigation is dependent upon the direction the investigation is taking. He notes that many criminal investigations require follow-up during both business hours and evening hours. The follow-up investigation needs to be done promptly and at the most advantageous times.

3) What factors external to an investigation need to be considered in deciding on a shift schedule for arson investigators?

Shift schedules are so commonplace for personnel in the fire service it is easy to think of them as simply a calendar of when to report for work. It is easy to forget that a schedule

must take into account a number of issues. Levine and McEwen (1985) detail some of these issues in their manual on *Patrol Deployment*. As they point out,

At first glance, the work schedule may appear to be a simple presentation of reporting and off-duty times for officers; however, many issues such as shift rotation, interfacing with the work of other units, holidays and vacations, union agreements, and departmental policies on overtime and sick leave must all be considered when preparing the schedule. (p. 5)

While this is certainly a comprehensive list, it does not cover everything that needs to be considered in scheduling. Investigator safety, FLSA requirements, and ancillary duties are a few of the missing issues.

The combined role of origin and cause investigation and criminal follow-up conducted by Anne Arundel County fire investigators makes a number of external factors relevant that may or may not be applicable in other units. In addition, the investigators have two responsibilities beyond those I have typically found in investigation units. First, as part of a department wide program in fire safety, the investigators conduct fire safety inspections during normal duty hours. The investigators are assigned a number of buildings to inspect each month for compliance with the County Fire Prevention Code. Second, the investigators do the background investigations for applicants for positions in both the career and volunteer segments of the department. The volunteer applicant background checks are usually accomplished quickly. As such, they require a minimum amount of time. The career applicant checks are different. These background investigations are extensive. The background investigations done on prospective candidates for hire are extensive and generally take about two months to complete. Much of the work needed to complete these background

investigations requires work during normal business hours to reach current and previous employers. It also requires time in the early evening when people can be reached at home to speak with references. The times needed to complete background investigations are the same as those discussed for follow-up investigation in arson cases.

Another consideration is the budget. In other words, how much of the taxpayer's money are we going to spend? "The challenge for unit managers is providing the best coverage for the community while living within the bounds of budget allocations" (Managing Arson Control, 1994, p. 20). Shifts that schedule investigators for 24 hours or on a 10/14 schedule do not require call-out pay to handle fire investigations. However, these shifts may require overtime for case follow-up, to attend training, to cover leave, or to attend court. Shifts that provide less than twenty-four coverage will result in paying call-out pay to investigate fires that occur during the periods when no investigator is scheduled on-duty. These shifts may also require overtime for training, follow-up, or leave coverage depending on the arrangements.

As with any group of workers, there is a need for supervision. In the current arrangement, one supervisor, a lieutenant, is teamed with one investigator, making up a shift. In this way, the investigators always report to the same supervisor. In turn, each of the lieutenants reports to the Unit Captain. This arrangement provides unity of command. In their book on schedule design, Gill, et al., (1979) discuss unity of command as it pertains to fire fighters.

Unity of command is a management principle that states that each fire fighter should always report to the same superior officer. To have complete unity of command, the number of officers must equal the number of schedule groups, and the officers' schedules must be identical to the schedule of the fire

fighters under their command. Unity of command is considered desirable in that it is conducive to good teamwork. However, it may also be desirable for officers to rotate among companies and platoons in order to familiarize themselves with the fire fighters in other groups, and vice versa, and to standardize command practice among the various companies and platoons.

(p. 95)

These same management concepts can be applied to investigation units. The design of a shift schedule can be more flexible if unity of command is not a priority. However, as Levine and McEwen (1985) point out, if the decision is made that unity of command is desirable it necessitates coordinating the schedules of supervisors and subordinates. In Anne Arundel County, thus far, we have made unity of command a priority.

The need for training impacts decisions in shift scheduling. Fire investigators in Anne Arundel County are uniformed fire personnel, but they also have law enforcement powers. This dual role increases the amount of training each investigator must attend. The investigators must participate in the EMS/Fire/Rescue training. They must maintain their Emergency Medical Technician (EMT) certification, as well as, Cardiopulmonary Resuscitation (CPR) and Automatic External Defibrillator (AED) certification, and must attend both spring and fall skills development classes at the Fire Training Academy. In addition, they must also attend the spring and fall in-service training classes at the Police Training Academy to maintain their law enforcement skills. Given the dual training requirements, the statement made by Levine and McEwen (1985) that "...training time will have to be considered when the work schedule is developed" is doubly true for fire investigators (p. 5). Fire investigators also have a need to participate in additional training specific to the field of arson investigation. McGuinness (1979)

notes in his book that "the almost constant change in laws and techniques used by criminals makes ongoing training of Arson Investigation Unit personnel a paramount issue" (p. 14). It is obvious, based on the training needs, that training must be considered when designing an arson investigation shift schedule.

The design of a shift schedule must also take into consideration any prevailing laws. Gill, et al. (1979) relate that "external constraints being imposed from the federal, state, and local levels must be considered as scheduling decisions are made" (p. 100). The Fair Labor Standards Act (FLSA) is perhaps the best known and most comprehensive law governing employee schedules and hours of work. A number of FLSA issues are possible in considering shift schedules, including on-call time. A major aspect of the FLSA law is the limitation on the number of hours an employee can work before overtime must be paid to the employee. As the *Fire Investigation Unit Management Guide* (1997) points out, FLSA guidelines on overtime pay should be considered when designing schedules. Recently the Department received a ruling from the County Law Office regarding FLSA payment for the investigators, and a few personnel in other specific assignments. This ruling requires that the County pay the investigative lieutenants straight time pay for any hours worked beyond those hours normally scheduled, up to the point they hit the FLSA threshold. After they pass the FLSA limitation on hours of work, they must be paid overtime. Investigative personnel below the rank of lieutenant are covered by the union agreement and must be paid overtime for all hours worked beyond those normally scheduled. The payroll schedule is on a fourteen-day cycle and the FLSA tracking on a sixteen-day cycle. Since the sixteen-day cycle usually ends after the payroll cycle, it presents a complication in determining how much to pay the investigation lieutenants. Without knowing the results of the FLSA calculations, it is not possible to

determine how many hours should be paid at straight time and how many hours should be paid at the overtime rate. As such, the payment for hours outside those normally scheduled must usually be withheld until the following pay cycle. The investigation lieutenants often wait more than three weeks, after working overtime, before they are compensated for those hours.

Investigator safety is yet another consideration. The current arrangement of two investigators per shift often requires an investigator to work alone. A management decision was made with the implementation of the current shift not to incur overtime to maintain a second investigator on-duty. When an investigator is in training, on vacation or sick leave, in court, or unavailable for any other reason, the other investigator on the shift must work alone. Working alone for a fire investigator can be a misnomer. McGuiness (1979) makes the point that suppression personnel can be required to remain at the scene to render assistance and security when an investigator is working alone. The practice of keeping a suppression unit on-scene is used under the current system, but investigators are sometimes reluctant to keep a suppression unit tied up during the investigation phase. The safety of the investigator can be an issue away from the fire scene as well. Investigators do have arrest powers and may be required to serve search warrants, arrest warrants, or otherwise expose themselves to encounters with potentially hostile witnesses and suspects. In his book, McGuiness (1979) addresses this concern by writing:

If completion of the initial investigation requires that the investigator move beyond the limited area of the fire scene, and there is a question about his or her physical safety, it may be advisable to invoke a prearranged procedure for back-up support. Back-up may be obtained from other Unit personnel or in many localities, the police department. (p. 6)

Investigators do have the authority to request the call-back of another investigator when they need assistance. This is often done on large fires or when a second request for an investigation comes in before the investigator has cleared the first call. In addition, the assistance of the County Police can be sought. Fire investigators attend the Anne Arundel County Police Training Academy and a good working relationship exists between the two agencies.

Another external factor for consideration is the union contract. Personnel below the rank of lieutenant are covered by the County's collective bargaining agreement with the fire fighter's union. This agreement stipulates that the hours of work and the shifts currently in effect shall continue (Union Contract, 1997). It is common practice for unions to seek provisions in their contracts that try to maintain existing shift schedules. As Gill, et al. (1979) note, "...contracts tend to perpetuate current scheduling practices by requiring that changes be agreed upon through collective bargaining" (p. 110). The contract between the union and the County is structured in this way. It requires that the County negotiate any change in work hours. A particularly onerous requirement is that the County cannot effect a change in work hours unless it is clearly shown that exigent conditions exist requiring the change (Union Contract, 1997).

4. Do model fire investigation shifts exist that would be suitable for Anne Arundel County?

The research uncovered numerous discussions on the various aspects of designing a shift schedule, but little in the way of model schedules. I was able to find information on variable scheduling, uniform scheduling, and a number of other issues for consideration in designing a schedule. The materials also discuss the need for simplicity in designing a shift schedule and the attitudes and needs of the employee. All this information leaves the reader

with the impression that designing a shift schedule is not easy. In fact, Gill, et al. (1979) report that "...designing a new schedule is a difficult and time consuming task due to the lack of schedule-related training and resource material" (p. 10). The lack of training is also noted by Burton (1995). In the article *Schedules, Schedules, and More Schedules* he writes that, "there is not a lot of training available either. Not too many (any?) supervisor's school or courses include components about scheduling" (p. 18). Perhaps this is why little variation is found in the schedules typically used to staff fire investigation units. In the *Fire Investigation Unit Management Guide* (1997) a number of possible schedules are provided. The Guide suggests that,

different types of scheduling can be instituted. There is the regular five-day workweek at 8 hours a day or a four-day workweek at 10 hours per day. You can also do a 9/80 schedule which is five days one week followed by four days the following week, each day being 9 hours long. Finally, you can do platoon duty schedules which can vary. There can be 2 - 3 platoons working 24 hour shifts, 12/12 shifts, 10/14 shifts, or three to four 8 hour overlapping shifts. (p. 1-5)

Each of the shift schedules described above is a uniform schedule. In other words, none of these schedules fluctuates the number of personnel assigned to a particular time of day, or day of the week, based on call volume.

During my interview with Mr. Poole (telephone interview, September 29, 1998) he confirms that most units work one of the commonly used schedules. These schedules being 24-hour shifts, 10/14 shifts, five 8-hour days, or four 10-hour days. Mr. Poole also confirms that little information is published in this field despite the many studies done by Tri-Data

Corporation for the USFA. He told me this is because the studies are done under a contract that holds all parties to a confidentiality agreement. Mr. Poole (telephone interview, September 29, 1998) did mention he had seen a unique schedule in Virginia Beach that he felt was very effective. He suggested I contact the Virginia Beach Fire Department to obtain specific information. He could not give me the specifics because of the confidentiality aspect of the studies.

Contact was made by telephone with Captain Stanley Foster. Captain Foster is the unit commander of the Virginia Beach Fire Department, Fire Investigation Unit. Captain Foster (telephone interview, October 7, 1998) tells me his investigation staff is comprised of six personnel, including him. One investigator, by choice is permanently assigned to the night shift, working from 1500 hours to 2300 hours Monday through Friday. The other investigators normally work a straight five-day workweek. One of the daytime investigators rotates to the night shift each night. This arrangement provides two nighttime investigators. The hours between the end of the night shift, the start of the day shift, and weekend hours are covered by the investigators in an on-call status. The on-call is rotated among the investigation staff. This schedule arrangement shows that the fire investigation unit in Virginia Beach places an emphasis on having investigators available during normal business hours. They also provide evening coverage through the permanent assignment of one investigator to nights and the rotation of other investigators. Captain Foster (telephone interview, October 7, 1998) was not able to tell me if this schedule is more effective than the previous schedule, which was all day work, because arrest and conviction rates are not well tracked in their unit. The schedule change was precipitated by high overtime costs and excessive compensatory time being earned by call-outs. Captain Foster (telephone interview, October 7, 1998) indicates the evening hours

help offset much of the overtime and compensatory time, because a large percentage of their calls are between 1800 hours and 2300 hours. He also said they work down to one investigator to accommodate leave. Captain Foster (telephone interview, October 7, 1998) does note that the evening hours have worked out well. He believes these hours are productive for conducting interviews and have been especially helpful in juvenile cases. He told me they provide a chance to interview youths away from the school environment and with their parents present.

A review of investigator responses in Anne Arundel County during 1997 reveals the busiest hours are between 0700 and 1500. Investigators made 201 responses during these hours. It should be noted that in 1997 a significant number of bomb threats occurred during school hours. The hours between 1500 and 2300 have 153 responses for investigators in 1997. After 2300 hours, the statistics show that investigators responded to 114 calls. Interestingly the 110 calls on the weekend in 1997 are divided evenly, with 55 on Saturday and 55 on Sunday (see Appendix A).

The Virginia Beach schedule is simplistic. Simplicity is a desirable pattern in shift schedule design. Gill, et al. (1979) write that, "unless a schedule involves simple, regular patterns, it may be difficult for fire fighters to determine when they are scheduled to be on duty without a one-year calendar of assignments..." (p. 29). The authors also point out that a complex schedule may make it difficult for personnel to plan activities with their families or work a second job. Personnel are not the only ones who have difficulty when a schedule is complex. Complex schedules can be a hindrance to supervisors, administrators, and payroll clerks. Gill, et al. (1979) later in the same book note that, "schedules become more difficult to implement and administer as they become more complex" (p. 95).

The concept of designing a schedule that will satisfy the employees personal needs may sound like a good idea. Unfortunately, at least two problems surface. The first problem is finding a schedule that satisfies every employee. This may be simple if there is only one employee involved. However, when multiple employees are involved, it becomes virtually impossible. As Burton (1995) notes, "...you cannot please everyone. Actually, you usually can't please anyone. Everyone has some reason why any schedule will work a hardship on them" (p. 18). The second problem is that if work assignments are designed solely to meet the needs of the employee, there is little likelihood it will be a schedule conducive to good investigative work. The *Fire Investigation Unit Management Guide* (1997) recognizes the need to consider unit and individual performance as a primary factor in managing an investigation unit. The Management Guide states that, "as a unit manager it is also necessary for you to improve the work environment so that the work force will be effective in investigations and responsive towards you" (p. 1-3). Later the *Fire Investigation Unit Management Guide* (1997) notes that "morale, productivity, and job satisfaction are enhanced when people know that there are standards of performance to be met..." (p. 1-8). If the shift schedule inhibits personnel from meeting performance objectives, diminished employee satisfaction will result.

One final option in designing a shift schedule would be to base it on an analysis of when fires occur and investigators are needed. This concept is known as "Peak-Load Staffing" or systems status management and is widely used in the private ambulance sector. The idea is to have more personnel on-duty at the times shown to have the highest demand. Trying to design a shift schedule for investigators using this method may not be practical. First, as Stout (1989) notes "...the basic concept of 'more calls/more units -- fewer calls/fewer units' is by

itself correct but impractical for use in developing shift schedules" (p. 73). In considering this concept for arson investigators, it must also be remembered that responding to the fire is only one aspect of the job. The need to conduct follow-up investigative work is not based solely on when the fire happened.

DISCUSSION

The research does indicate that the success rate of solving arson cases can be improved through strategies that use better case management. According to Mr. Poole (telephone interview, September 29, 1998) better case management has been identified as a significant factor in solving arson crimes. The statistical data suggest that perhaps the fire service should be concerned about the effectiveness of arson investigations. "Numerous United States Fire Administration (USFA) studies have found that arson units need to improve the process of case review, prioritization, quality control, and the assignment and tracking of cases" (Fire Investigation, 1997, p. 4-1). Mr. Poole (telephone interview, September 29, 1998) maintains that the studies done by Tri-Data were focused on arson case management. The findings of these studies indicates a need to adjust the shifts typically being used by arson investigation units if they want to manage cases more effectively.

The main purpose of an investigation unit is the prevention of arson. The most successful way to accomplish this objective is through the prosecution and incarceration of those responsible for the crime. The investigation unit in Anne Arundel County made arrests in only 10% of its arson cases during 1997, but obtained convictions in 4% of those cases (see Appendix A). When compared to the national average the arrest statistics are poor, but the conviction rate is slightly higher than average. Statistics alone may not tell the whole story, but

they are a necessary tool in measuring performance. This point is made in the *Fire Investigation Unit Management Guide* (1997). The Management Guide states that "the most important aspect of data collection and management from the unit manager's perspective is having access to information that helps evaluate unit effectiveness, and its efforts to address the arson problem in the community" (p. 5-3). An encouraging performance measure is the conviction rate for arson in Anne Arundel County. If investigators were better able to investigate the crime of arson they might improve the arrest rate. The conviction rate in Anne Arundel County demonstrates that the investigators produce winnable cases. If case management can be improved, we should see more arrests and even more convictions.

The research indicates that the schedule investigators work can have an impact on effectiveness. The schedule currently worked by Anne Arundel County's investigators may work well for origin and cause investigation, but is not complimentary to good case management. "Case management can be broken down into four components: comprehensive information collection; a case prioritization system; case assignments; and time management" (Management for Arson, 1996, p. 1-21). The schedule in use in Anne Arundel County does little to facilitate case management components. In his book on criminal investigations, Wilson (1993) writes that investigators must be in a position to spend the necessary time to make a legally supportable case. He goes on to say that this does not mean the investigator has an unlimited amount of time, but rather investigators must prioritize cases. The 10/14 schedule provides a four-day break after four days of work. If an investigator catches a fire on his last night shift, there can be a four-day gap before any additional work is done on the case. In many cases the initial report is not written until the investigator returns from his or her break. The initial report is critical to case management. Without this report the unit supervisor cannot

review the report for solvability factors or make case priority decisions. The 10/14 shift neglects the final component in case management as well. Regardless of when an investigator catches a fire, time management takes a backseat when the investigator is sleeping at a fire station waiting for a call. The importance of time management in the investigative process should not be overlooked. The course manual for *Management of Arson Prevention and Control* (1996) emphasizes the importance of establishing goals, objectives, and action plans, and the need to reevaluate situations and institute change when necessary to better use investigative time. Better use of time is an important factor in practicing good case management.

Designing a schedule would be easier if the only consideration was getting the job done. Investigators could work 2 p.m. to 10 p.m. five days a week and be on-call the rest of the time. While this might serve the needs of the unit, it certainly would not be acceptable to the employees. Nor would this schedule be acceptable to management. A schedule of this design would necessitate excessive overtime for call-out, training and court time. The key is in finding a schedule that reasonably accommodates both the needs of the unit and the needs of the employees. Based on the research, this would seem to be a daunting task, but a necessary one. As McGuiness (1979) notes,

...the implementation of new approaches are necessary if we are to combat the arson problem more effectively. Since additional resources are difficult to obtain in today's economic climate, it is essential to implement new approaches in order to get the most out of current resources. (p. 2)

One of the purposes of scheduling is to effectively utilize available resources. The research illustrates however, that many factors influence scheduling.

The design of a schedule must take into consideration many factors beyond case management and employee concerns. FLSA regulations play an important role with respect to employee compensation. The problem is that it is difficult to ensure FLSA rules are not being violated. The rules are complex and conflicting rulings have clouded the issue of how to interpret the law for investigators (Managing Arson Control, 1994). Questions arise as to which FLSA threshold fire investigators should be subjected. Anne Arundel County uses the law enforcement guidelines for fire investigators, but I know of at least one jurisdiction using the fire fighter threshold. The question of compensation or calculation of time on-call is also subject to interpretation. This research does not attempt to answer FLSA questions. They are mentioned because they must be considered prior to implementation of a new shift schedule. Any jurisdiction contemplating the implementation of any schedule design should obtain legal advice regarding FLSA compliance.

The issue of safety is always a concern, to management, employees, and the union. The current system often requires investigators to work alone. It is impractical to expect that a schedule can be designed, with current staffing, which will not require some investigative work to be done by a lone investigator. Safety concerns can be offset by the development of policies that require investigators to keep at least one other person with them at any fire investigation scene, or when serving warrants or conducting interviews.

The discussion of designing a schedule to improve investigation effectiveness is moot if a case cannot be made that exigent circumstances exist. The exigency requirement is part of the union contract. The data, however, supports a change. The national average is a 15% arrest rate in arson crimes. In Anne Arundel County the arrest rate is only 10%. This is a significant

difference and in my opinion meets the exigency requirement. The research indicates that shift schedules can be arranged to better support the investigative process.

What is not resolved is, what is the best shift to meet the needs of effective fire and arson investigation in Anne Arundel County. No evidence exists that a model shift has been developed. The research did not find a fire investigation unit with documented improvement or better arrest and conviction statistics that correlate to a particular shift. This alone should not deter efforts to improve the effectiveness of fire and arson investigation in Anne Arundel County. Several adjustments to the shift schedule may ultimately be needed to find the right schedule for this unique field of criminal investigation. After all, the final phase of implementing change requires that the change be evaluated against the goals and objectives the change set out to accomplish. Any adjustments, however, should be minimal if careful consideration is given to designing a schedule that maximizes the ability to meet goals and objectives. In his study of fire service shifts Gillespie (1997) writes that "... the public fire service needs to make changes of many kinds to improve efficiency, effectiveness, and safety" (p. 13). The lack of effectiveness in solving arson cases in Anne Arundel County points to a need for change to better serve the taxpayer.

RECOMMENDATIONS

Anne Arundel County needs a different shift for the fire investigation function if we continue to include responsibility for the criminal aspect of fire investigation. The new shift schedule must provide for better case management and ultimately result in improved arrest and conviction rates. The research shows that better case management means more opportunity to follow-up on cases within the first 24 to 72 hours after the fire. The shift must provide the

investigator with more on-duty hours during the times shown most effective in conducting criminal case follow-up. The schedule must also be more conducive to implementing case management practices that are recognized as being critical to case solvability rates. The components of case management are comprehensive information collection, case prioritization, case assignments, and time management (Managing For Arson, 1996). The goal in establishing a new shift is to improve the effectiveness of the investigation unit in arson cases. In short, this means more arrests, more convictions, and more incarcerations. The argument for case management is also made by Wilson (1993) who writes that investigative units must determine those cases most likely to result in a successful investigation. The objectives need to be accomplished to meet the goal of preventing arson through the effects of deterrence.

The new shift must also take into consideration FLSA, investigator safety, and the union contract. Gill, et al. (1979) sum it up when they state "...several issues need to be considered in the design of and administration of schedules for non-suppression personnel" (p. 72). These same authors provide a guide for designing a new schedule. They indicate that "schedule design involves a series of interrelated steps which include; analyzing the current schedule; identifying schedule design objectives and constraints; and designing, selling, implementing, and evaluating the new schedule" (p. 111). The first two stages of this plan have been completed. The current schedule has been analyzed and the design objectives and constraints have been identified. The next step is to design a new shift. The following recommendations are based on current staffing levels. An increase in staffing levels would likely provide additional options. A decrease in staffing levels would limit options.

Only one schedule other than the standard options is identified in the research. That schedule, being used in Virginia Beach, provides coverage from 0700 hours to 2300 Monday

through Friday. This schedule has the majority of investigators working day time hours. One investigator is permanently assigned to nights and the other investigators rotate one at a time onto nights. The schedule appears to optimize the use of the investigative staff by providing coverage during the hours identified as the best time for case follow-up work. In addition, it provides on-duty response to fires for the majority of the calls. This type of schedule will require overtime for calls during non-duty hours. However, the overtime for callback may be significantly offset in overtime savings for training time, court time, and the time now spent doing casework on overtime. Three possible schedules are provided for consideration (see Appendix B). All three schedules provide increases in the time investigators are scheduled to work during both normal business hours and evening hours. In the sample schedules, the investigators are shown as numbers one through eight. All three schedules repeat after an eight-week cycle.

One option is to return to the schedule used by the investigators before the implementation of the current shift. The schedule used before March of 1992 had four personnel assigned to each of two shifts. The investigators worked a five-day week, working either 0800 to 1600 hours, or 1600 to 2400 hours Monday through Friday. On this schedule, the shifts rotate after a week, so that investigators alternate between day shift and night shift. This schedule meets at least three of the case management objectives. First, investigators are on-duty more often during normal business hours and more often during early evening hours. These times are identified as crucial to case follow-up work. More effort in case follow-up during these times should improve information collection. Second, the addition of hours during crucial casework time should help improve time management. Third, this schedule provides an

opportunity for improved case management through improved contact with the Unit Captain. The Captain will be better able to oversee reports, case assignments, and case prioritization.

The old shift does not eliminate investigator only responses. Calls after midnight and on weekends will need to be handled by an on-call investigator, who would respond as the lone investigator. It does however, reduce other investigator only assignments. Investigators can work in teams of two, three, or four investigators to conduct a neighborhood canvas, investigate a scene during normal shift hours, or make contacts with businesses or other governmental agencies. This shift eases the scheduling of training and reduces the chances that an investigator will be alone when another investigator is in training or on leave. The old shift could also alleviate the FLSA versus overtime reporting problem. Since this schedule has investigators working a 40-hour week, they could be placed on a 14-day FLSA cycle. The 14-day cycle allows 84 hours of work during the 14-day period. FLSA reporting could be aligned with payroll reporting. This schedule is simplistic and easy to administer. When this schedule was in effect policies were in place regarding leave usage, investigator callback, and requesting additional investigative resources. These policies would need to be re-instituted after evaluation for possible improvement.

A second option, the 9/80 schedule was briefly covered in the research. This schedule could be implemented using current investigative staffing. In this schedule, investigators work five 9-hour days one week and four 9-hour days the following week. The 9/80 schedule is similar to the old schedule discussed above, but provides two additional benefits. First, the expansion of hours per day from eight to nine hours allows on-duty coverage from 0700 to 2400. The day shift could work from 0700 hours to 1600 hours. The night shift would report at 1500 hours and work until midnight. The second benefit is the one-hour overlap between

1500 and 1600 hours. This time could be used for the shifts to exchange information, pass off a hot case to the on-coming shift, or conduct staff meetings. Since this shift requires callback, the same policies previously used for leave usage, investigator callback, and requesting additional investigative resources would need to be re-implemented. This schedule, as in the first option, is simple providing ease in administration. It is most simple if the investigator always has the same day off during the four-day segment. It becomes slightly more complex, but workable if the day off rotates among the investigators. As in the first option, the investigator works 80 hours during the 14-day schedule, thus remaining under the FLSA threshold in normally scheduled hours.

A third option is to go to a schedule of four 10-hour shifts. Investigators would work four 10-hour days one week and four 10-hour nights the following week. Again, the day off for each investigator could be predetermined and constant each week or could rotate among the investigators. The advantage to this schedule is a further expansion of on-duty hours and the possibility of extending the time the shifts overlap. Statistically the two hours before 0700 have the least potential for an investigator response (See Appendix A). The day shift could work from 0700 to 1700 hours. The night shift could report either at 1500 hours and remain on-duty until 0100, or could report at 1600 and remain until 0200 hours. Another possibility would be to have one night investigator each night report at 1900 and remain on-duty until 0700 hours. The last scenario would leave only the weekends to be covered on-call. If the investigators rotated the late night coverage during the week, they would still be on-duty during prime casework hours at least two or three of the other evenings.

Policies regarding leave usage, investigator callback, and requesting additional investigative resources would be reinstated as in the two previous scenarios. The major

drawback to this schedule for administration is the complexity of the schedule, particularly if the day off is rotated. From the investigators viewpoint they may see at least two drawbacks. First, going off-duty at 0200 hours could be viewed as unreasonable. Second, the option of rotating coverage of a late night or swing shift investigator might not be desirable. Any proposed schedule change must be negotiated with the union. These two options could be presented and if strongly opposed removed as a fallback position.

In his article on "Peak-Load Staffing," Stout (1989) recommends that employees bid for the shifts they prefer to work. He notes that new shifts can be scary for employees. To alleviate the employees concerns he recommends that employees conduct pretend bidding to better judge how a particular shift will work for them. The implementation of a new shift requires negotiations with the union. During the negotiations, the investigators could experiment with pretend scheduling for each of the proposed shifts. Administration and the employees can track the number of callbacks, overtime expenditures, leave usage issues, and the need for calling back off-duty personnel not scheduled to be on-call. The pretend period may make clear that one option is the best.

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Appendix A
1997 Statistical Data for
Anne Arundel County Fire Investigation

Total Number of Cases	474
Total Number of Fire Cases	314
Total Number of Non-Fire Cases	160

CAES LISTED BY CAUSE	Percentage of Total Fires	
Incendiary	129	41.08%
Suspicious	2	0.64%
Accidental	120	38.22%
Natural	2	0.64%
Other	1	0.32%
Undetermined	60	19.11%
Total Fire Incidents	314	100.00%

Cases Closed by Arrest	13	10.08%
Convictions	5	3.88%

NON-FIRE INCIDENTS	Percentage of Total Incidents	
Incidents	152	95.00%
Internal Investigations	4	2.50%
False Alarms	4	2.50%
Total Non-Fire Incidents	160	100.00%

TOTAL INVESTIGATIONS	474	100%
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TIME OF DAY CALLS RECEIVED	Percentage of Calls Received	
0700 - 1459	201	42.41%
1500 - 2259	153	32%
2300 - 0659	114	24%
SUBTOTAL	468	99%
Time Not Applicable/Reported	6	1%
TOTAL	474	100%

DAY OF WEEK CALLS RECEIVED	Percentage of Calls Received	
Sunday	55	11.60%
Monday	77	16.24%
Tuesday	78	16.46%
Wednesday	68	14.35%
Thursday	78	16.46%
Friday	61	12.87%
Saturday	55	11.60%
SUBTOTAL	472	99.58%
Not Applicable/Reported	2	0.42%
TOTAL	474	100%

CALLS RECEIVED BY TIME OF DAY	Percentage of Calls Received	
0700 - 0759	16	3.38%
0800 - 0859	22	4.64%
0900 - 0959	24	5.06%
1000 - 1059	38	8.02%
1100 - 1159	38	8.02%
1200 - 1259	18	3.80%
1300 - 1359	16	3.38%
1400 - 1459	29	6.12%
1500 - 1559	20	4.22%
1600 - 1659	27	5.70%
1700 - 1759	18	3.80%
1800 - 1859	28	5.91%
1900 - 1959	17	3.59%
2000 - 2059	14	2.95%
2100 - 2159	14	2.95%
2200 - 2259	14	2.95%
2300 - 2359	19	4.01%
2400 - 0059	16	3.38%
0100 - 0159	12	2.53%
0200 - 0259	18	3.80%
0300 - 0359	13	2.74%
0400 - 0459	18	3.80%
0500 - 0559	9	1.90%
0600 - 0659	9	1.90%
SUBTOTAL	467	98.52%
Not Applicable/Reported	7	1.48%
TOTAL	474	100.00%

Appendix B

Sample Shift Schedules

4/10 Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January 1999					1	2 1
3 1	4 <u>D N</u> 1 5 6 3 7 4	5 <u>D N</u> 1 5 2 7 4 8	6 <u>D N</u> 1 5 2 6 3 8	7 <u>D N</u> 1 2 6 3 7 4 8	8 <u>D N</u> 5 2 6 3 7 4 8	9 5
10 5	11 <u>D N</u> 5 6 2 7 3 4	12 <u>D N</u> 5 1 6 2 3 8	13 <u>D N</u> 5 1 2 7 8 4	14 <u>D N</u> 5 1 6 7 3 8 4	15 <u>D N</u> 1 6 2 7 3 8 4	16 2
17 2	18 <u>D N</u> 2 6 3 7 4 8	19 <u>D N</u> 1 5 2 6 3 7	20 <u>D N</u> 1 5 2 6 4 8	21 <u>D N</u> 1 5 2 3 7 4 8	22 <u>D N</u> 1 5 6 3 7 4 8	23 6
24 6	25 <u>D N</u> 1 6 7 3 8 4	26 <u>D N</u> 5 6 2 7 3 4	27 <u>D N</u> 5 1 6 2 3 8	28 <u>D N</u> 5 1 6 2 7 8 4	29 <u>D N</u> 5 1 2 7 3 8 4	30 3
31 3						

4/10 Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
February 1999						
	1 <u>D N</u> 1 5 3 7 4 8	2 <u>D N</u> 2 6 3 7 4 8	3 <u>D N</u> 1 5 2 6 3 7	4 <u>D N</u> 1 5 2 6 3 7 4 8	5 <u>D N</u> 1 5 2 6 7 4 8	6 7
7 7	8 <u>D N</u> 5 1 2 7 3 8 4	9 <u>D N</u> 1 6 7 3 8 4	10 <u>D N</u> 5 6 2 7 3 4	11 <u>D N</u> 5 1 6 2 7 3 8	12 <u>D N</u> 5 1 6 2 3 8 4	13 4
14 4	15 <u>D N</u> 1 5 2 6 4 8	16 <u>D N</u> 1 5 3 7 4 8	17 <u>D N</u> 2 6 3 7 4 8	18 <u>D N</u> 1 5 2 6 3 7 4	19 <u>D N</u> 1 5 2 6 3 7 8	20 8
21 8	22 <u>D N</u> 5 1 6 2 3 8	23 <u>D N</u> 5 1 2 7 3 8 4	24 <u>D N</u> 1 6 7 3 8 4	25 <u>D N</u> 5 6 2 7 3 8 4	26 <u>D N</u> 5 1 6 2 7 3 4	27 1
28 1						

9/80 Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January 1999					1	2
3 1	4 <u>D</u> <u>N</u> 1 5 2 6 3 7 4	5 <u>D</u> <u>N</u> 1 5 2 3 7 4 8	6 <u>D</u> <u>N</u> 1 5 2 6 3 4 8	7 <u>D</u> <u>N</u> 1 2 6 3 7 4 8	8 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	9 5
10 5	11 <u>D</u> <u>N</u> 5 6 2 7 3 8 4	12 <u>D</u> <u>N</u> 5 1 6 2 7 3 8	13 <u>D</u> <u>N</u> 5 1 6 2 7 8 4	14 <u>D</u> <u>N</u> 5 1 6 7 3 8 4	15 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	16 2
17 2	18 <u>D</u> <u>N</u> 1 2 6 3 7 4 8	19 <u>D</u> <u>N</u> 1 5 2 6 3 7 4	20 <u>D</u> <u>N</u> 1 5 2 6 5 4 8	21 <u>D</u> <u>N</u> 1 5 2 3 7 4 8	22 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	23 6
24 6	25 <u>D</u> <u>N</u> 5 1 6 7 3 8 4	26 <u>D</u> <u>N</u> 5 6 2 7 3 8 4	27 <u>D</u> <u>N</u> 5 1 6 2 7 3 8	28 <u>D</u> <u>N</u> 5 1 6 2 7 8 4	29 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	30 3
31 3						

9/80 Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
February 1999						
	1 <u>D</u> <u>N</u> 1 5 2 3 7 4 8	2 <u>D</u> <u>N</u> 1 2 6 3 7 4 8	3 <u>D</u> <u>N</u> 1 5 2 6 3 7 4	4 <u>D</u> <u>N</u> 1 5 2 6 3 4 8	5 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	6 7
7 7	8 <u>D</u> <u>N</u> 5 1 6 2 7 8 4	9 <u>D</u> <u>N</u> 5 1 6 7 3 8 4	10 <u>D</u> <u>N</u> 5 6 2 7 3 8 4	11 <u>D</u> <u>N</u> 5 1 6 2 7 3 8	12 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	13 4
14 4	15 <u>D</u> <u>N</u> 1 5 2 6 3 4 8	16 <u>D</u> <u>N</u> 1 5 2 3 7 4 8	17 <u>D</u> <u>N</u> 1 2 6 3 7 4 8	18 <u>D</u> <u>N</u> 1 5 2 6 3 7 4	19 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	20 8
21 8	22 <u>D</u> <u>N</u> 5 1 6 2 7 3 8	23 <u>D</u> <u>N</u> 5 1 6 2 7 8 4	24 <u>D</u> <u>N</u> 5 1 6 7 3 8 4	25 <u>D</u> <u>N</u> 5 6 2 7 3 8 4	26 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	27 1
28 1						

5 Day/Week 8-Hour/Day Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January 1999					1	2
3 1	4 <u>D N</u> 1 5 2 6 3 7 4 8	5 <u>D N</u> 1 5 2 6 3 7 4 8	6 <u>D N</u> 1 5 2 6 3 7 4 8	7 <u>D N</u> 1 5 2 6 3 7 4 8	8 <u>D N</u> 1 5 2 6 3 7 4 8	9 5
10 5	11 <u>D N</u> 5 1 6 2 7 3 8 4	12 <u>D N</u> 5 1 6 2 7 3 8	13 <u>D N</u> 5 1 6 2 7 3 8 4	14 <u>D N</u> 5 1 6 2 7 3 8 4	15 <u>D N</u> 5 1 6 2 7 3 8 4	16 2
17 2	18 <u>D N</u> 1 5 2 6 3 7 4 8	19 <u>D N</u> 1 5 2 6 3 7 4 8	20 <u>D N</u> 1 5 2 6 3 7 4 8	21 <u>D N</u> 1 5 2 6 3 7 4 8	22 <u>D N</u> 1 5 2 6 3 7 4 8	23 6
24 6	25 <u>D N</u> 5 1 6 2 7 3 8 4	26 <u>D N</u> 5 1 6 2 7 3 8 4	27 <u>D N</u> 5 1 6 2 7 3 8 4	28 <u>D N</u> 5 1 6 2 7 3 8 4	29 <u>D N</u> 5 1 6 2 7 3 8 4	30 3
31 3						

5 Day/Week 8-Hour/Day Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
February 1999						
	1 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	2 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	3 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	4 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	5 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	6 7
7 7	8 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	9 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	10 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	11 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	12 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	13 4
14 4	15 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	16 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	17 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	18 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	19 <u>D</u> <u>N</u> 1 5 2 6 3 7 4 8	20 8
21 8	22 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	23 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	24 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	25 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	26 <u>D</u> <u>N</u> 5 1 6 2 7 3 8 4	27 1
28 1						